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COOP PHOKEW : DEVELOPMENT OF A MICRO ARC PLASMA MACHINE FOR NUCLEAR MATERIAL APPLICATIONS . THESIS ADVISOR : ASSIST.PROF. SUVIT PUNNACHAIYA, THESIS CO-ADVISOR : ASSO. VIRUL MANGCLAVIRAJ : 66 pp. ISBN 974-636-873-7

Arc plasma operating at low current between 0.1-15 A can be categorized as microplasma welding. It is a high heat source for welding miniature and thin metal sheet requiring very thin joint with little shrinkage. Microwelding has been widely applied in nuclear industry to seal radioactive sources and butt weld steam pipes heat exchanger system in nuclear power plants. The objective of this research is to design and construct the microplasma source that can vary its output current from 0.5 to 20 A providing open circuit voltage of 80 Volts using only local materials and equipment supplies. The main component of the microplasma power source is the switching type DC power source with constant current output employing power MOSFET transistor. An engine ignition coil is used to generate high voltage in Tesla type HF discharge for arc plasma ignition.

The developed unit significantly reduced the size and weight of microplasma power source. The unit successfully operates continuously under short-circuit condition from 0.5 -20 A with ripple less than 2.5 A at maximum current. TIG arc torch was used to demonstrate the arc plasma heat source. Using the argon gas flow rate of 8-10 liters/min and distance between workpiece and electrode of 3 mm, arc flame can be stably maintained at 10 A and higher ; generating sufficiently high heat output to weld No. 18 stainless steel. In order to operate at a current lower than 10 A, a special microplasma torch with an electrode less than 1 mm in size is required.

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